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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/631,171	07/31/2003	Pei-Yang Yan	ITL.0952US (P15976)	1420
21906	7590	05/05/2005	EXAMINER	
TROP PRUNER & HU, PC 8554 KATY FREEWAY SUITE 100 HOUSTON, TX 77024			ROSASCO, STEPHEN D	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 05/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/631,171

Applicant(s)

YAN, PEI-YANG

Examiner

Stephen Rosasco

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-28 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-56 of U.S. Patent No. 6,607,862 in view of Singh et al. (6,724,462). Singh et al. teach in Table 8 shows layer materials and thicknesses for Examples 72 to 76 which comprise 49 periods of Mo/Si with the additional period formed by the X/Z combination again terminated with a Ru capping layer. The reference example 72 represents a fully oxidised top Si layer upon which a Ru capping layer is applied.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except

that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Yan et al. (6,607,862).

The claimed invention is directed to a method comprising: forming an extreme ultraviolet lithography blank having a multilayer stack; forming a non-ruthenium spacer layer over said multilayer stack; and forming a ruthenium capping layer over said spacer layer.

And wherein, forming a non-ruthenium spacer layer over said multilayer stack includes forming a silicon spacer layer having a thickness of at least about 2.4 nanometers.

And including forming an interface layer between said non-ruthenium spacer layer and said ruthenium capping layer to prevent diffusion between said non-ruthenium spacer layer and said ruthenium capping layer.

The applicant states that extreme ultraviolet lithography masks are reflective masks fabricated by depositing interference multilayers such as molybdenum and silicon in alternating layers. The very top ending layer is referred to as a capping layer. Typically a silicon layer is used as a capping layer. The thicker silicon capping layer is needed because of the mask patterning process control requirements. In the mask patterning process, the silicon capping layer serves as the etch stop layer for the buffer layer etch.

During the buffer layer etch, when the etch selectivity to the multilayer capping layer is low, the capping layer is partially and non-uniformly removed. For example, one promising buffer layer for extreme ultraviolet lithography mask patterning is silicon dioxide. However, the etch selectivity to the silicon capping layer in a square mask etcher

is rather low, for example, about 3 to 1. Thus, there is a need for better ways to make blanks for extreme ultraviolet lithography.

A ruthenium capping layer 14 is resistant to the oxidation. In addition, the etch selectivity of the buffer silicon dioxide layer to ruthenium is much larger than that of a silicon capping layer. The ruthenium layer also has better chemical cleaning resistance than a silicon capping layer.

Yan et al. teach a photolithography mask for use with extreme ultraviolet lithography (EUVL) that uses extreme ultraviolet (EUV) illuminating radiation, said mask comprising: a pattern layer selectively formed on a substrate in a photomask pattern; a multilayer stack formed over said pattern layer and said substrate that is substantially reflective of said EUV illuminating radiation; a supplemental multilayer stack formed atop said multilayer stack; and an absorber material formed in trenches patterned into said supplemental multilayer stack, said absorber material being substantially absorptive of said EUV illuminating radiation, said trenches being located substantially over the borders between said pattern layer and said substrate.

further comprising a thin amorphous silicon layer formed over said cap layer and said absorptive material.

wherein said absorptive layer is formed from chromium, tungsten, tantalum, tantalum nitride, aluminum, germanium, silicon germanium or copper.

Yan et al. also teach (col. 8, lines 24-39) that a planarizing cap layer 1011 is deposited over the supplemental multilayer stack 1009. The cap layer 1011 is preferably on the order of 40 to 120 angstroms thick. In one embodiment, the cap layer 1011 is formed

from silicon. Alternatively, the cap layer 1011 may be formed from other materials, such as ruthenium.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
04/27/05